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ABSTRACT

Convergence theory, which explains changes in social systems, predicts that student-teacher ratios will become more similar worldwide under the impact of economic accumulation, technological utilization, industrialization, location and growth of the student-age population, enrollment expansion, and changes in each society's relationship to the individual. To test this proposition, student-teacher ratios at the primary, secondary, and tertiary (postsecondary) levels were computed for 1950, 1965, and 1974/75 for 34 low-income countries, 59 middle-income countries, 18 industrialized countries, and 11 centrally-planned countries. The differences in country income levels approximate the differences in economic development being tested. Further historical testing used data on student-teacher ratios in 24 European countries from 1860 to 1960. Results for primary education show strong convergence toward lower student-teacher ratios through time and across economic levels. Ratios for secondary and postsecondary education show less evidence of convergence, although both industrialized and centrally-planned countries do converge toward lower ratios at the secondary level. Appendices list the student-teacher ratios for the 122 developed and developing countries and the 24 European countries. (RW)

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CROSS-NATIONAL COMPARISON OF
STUDENT-TO-TEACHER RATIOS:
AN EXAMPLE IN CONVERGENCE THEORY

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Raw and modified enrollments and expenditures aside, student-to-teacher ratios are one of the most frequently examined dimensions of educational systems found in the cross-national literature. The significance of the student/teacher ratio rests upon the validity of the assumption that it is an indicator of class size and consequently, variations of it result in qualitative changes in the formal instructional situation of the schools. This assumption has been questioned on two points: the relationship between the student/teacher ratio, as calculated by dividing the total number of students in a nation by the number of teachers, and the actual class sizes¹; and the contention that the size of the student/teacher ratio produces qualitative changes in one specific learning setting, the classroom, by affecting the student-teacher interaction time.

The purpose of this investigation will not be to examine the evidence concerning the assumptions, rather to test a set of propositions located within the framework of convergence theory, and based upon the hypothesis that the individuals directly responsible for organizing the tasks of schooling across nations come to believe and desire to act as if the assumptions are true. This central proposition hints at the emergence of an increasingly global imperative regarding a specific element in the technology of instruction. Does this imperative indeed exist and, if so, why and how has it emerged? What forces are operating to create variations in the ratios across countries and in the rate of change of

¹ Problems with the ratio are caused by the heterogeneous character of student and especially teacher cross-nationally, the ambiguity of classifying aides and researchers, and the imperfection of data collection, all of which are greater as one moves from primary to tertiary levels.

the ratios over time across nations? Are there nations which deviate from any common trend regarding the ratios and how particularly does the U.S.A. compare to other nations along the dimension of student/teacher ratios? Finally, does the student/teacher ratio and changes in it differ according to the level of the educational system?

The theoretical perspective within which these preliminary questions are to be examined is that of convergence. The concept of convergence means the movement from points of diversity on some social phenomenon at an initial time toward some common point on the social phenomenon at a later time. The social phenomenon may be within any of the following broad categories of elements in the social system:

1. Modes of production and patterns of resource utilization.
2. Institutional arrays and institutional forms.
3. Structures or patterns of social relationships.
4. Systems of popular attitudes, values, and behavior.
5. Systems of political and economic control.

The social phenomenon being examined here is located within a specific institutional array, the modern educational system, and refers to an arrangement within one of its basic forms, the class, which has implications for the process of the dissemination of knowledge and the way society confronts the individual, in this case the student.

A set of forces which may produce convergence in the elements of a social system above, and social phenomena within them, are:

1. Technological changes, especially in the modes of production and distribution.
2. Ecological changes, especially in where people live.
3. Changes in the laws.
4. Changes in cultural systems, especially in the attitudes and values with which society collectively confronts each individual.

The order of the forces above approximate the degree of contribution of each to changes in the elements of the social system, with technological

change being the major dynamo and affecting each of the remaining forces, while each of these has a decreasing independent effect according to order. These producers of change affect the different elements of the social system in varying ways. Convergence expresses the variability in terms of the different rates with which the sociocultural subsystems change. The rate of change is directly related to the degree of interdependence and integration of the sociocultural subsystem, and social phenomena within, with technological change as found in modes of production and distribution. The forces of convergence may emerge in a nation by virtue of indigenous developments and/or through diffusion from other nations with which a country is interconnected and integrated.

School structures or arrangements, in contrast to economic organizations of production, are expected to exhibit slower rates of change. The direction of the change in educational systems should be relatively less oriented toward convergence because the instructional technology involved does not inherently confine social structures or arrangements to as high a degree, and because education is particularly open to historical or cultural conditioning. The outcomes of these special characteristics of the educational system may be the maintenance of diversity, divergence, parallel development, and convergence depending upon the structure of arrangement being examined within the educational system of a nation. Three sources of diversity in educational systems cross-nationally are:

1. Patterns of the allocation of educational resources.
2. Control structures, or arrangements of educational governance and administration.
3. Patterns of the funding responsibility of educational systems.

It is the main theme of this paper that despite the sources of diversity,

student/teacher ratios are one of many arrangements within the institutional array of the modern educational system which exhibit the trend of convergence world-wide.

The task of analyzing student/teacher ratios requires data at several points in time with attention being given to the direction of change, the dispersion of the ratios across time, and the rate of the change. The three factors which should be most important in determining the nature of change in student/teacher ratios are:

1. The degree of economic accumulation, technological utilization, and industrialization (the economic development set) within a nation.
2. The demographic and ecological experience of the nation in terms of the growth of the student age population, where they live, and degree of enrollment expansion during the time period being examined (enrollment shock).
3. Changes in the cultural system of the nation, especially in the way that society confronts the individual.

The proposition has been made many times that classes diminish in size as a nation and the public exchequer is enriched. Increases in the economic development set enable the nation to mobilize more resources for teacher training and to "fill-out" their strategies in the educational system so as to include qualitatively "better" arrangements. Enrollment shock may act as a force of resistance to both the development of lower ratios and/or slower rates of change and convergence. Changes in the way society collectively confronts individuals may have its parallel in the way the educational system confronts the student, such that more individual-oriented instruction requires a smaller class size.

To assess these propositions in a systematic manner, student/teacher ratios were calculated for the nations listed in the following World Bank categories of low income, middle income, industrialized and centrally planned economies at three time periods: 1950, 1965, 1974/75. The data

Low Income Countries

1 Bhutan	
2 Cambodia	
3 Lao PDR	
4 Ethiopia	
5 Mali	
6 Bangladesh	
7 Rwanda	
8 Somalia	
9 Upper Volta	
10 Burma	
11 Burundi	
12 Chad	
13 Nepal	
14 Benin	
15 Malawi	
16 Zaire	
17 Guinea	
18 India	
19 Viet Nam	
20 Afghanistan	
21 Niger	
22 Lesotho	
23 Mozambique	
24 Pakistan	
25 Tanzania	
26 Haiti	
27 Madagascar	
28 Sierra Leone	
29 Sri Lanka	
30 Central African Emp.	
31 Indonesia	
32 Kenya	
33 Uganda	
34 Yemen Arab Rep.	
Middle Income Countries	
35 Togo	
36 Egypt	
37 Yemen, PDR	
38 Cameroon	
39 Sudan	
40 Angola	
41 Mauritania	
42 Nigeria	
43 Thailand	
44 Bolivia	
45 Honduras	
46 Senegal	
47 Philippines	
48 Zambia	
49 Liberia	
50 El Salvador	
51 Papua New Guinea	
52 Congo, People's Rep.	
53 Morocco	
54 Rhodesia	
55 Ghana	
56 Ivory Coast	
57 Jordan	
58 Colombia	
59 Guatemala	
60 Ecuador	
61 Paraguay	
62 Korea, Rep. of	
63 Nicaragua	
64 Dominican Rep.	
65 Syrian Arab Rep.	

66 Peru
67 Tunisia
68 Malaysia
69 Algeria
70 Turkey
71 Costa Rica
72 Chile
73 China, Rep. of
74 Jamaica
75 Lebanon
76 Mexico
77 Brazil
78 Panama
79 Iraq
80 Uruguay
81 Romania
82 Argentina
83 Yugoslavia
84 Portugal
85 Iran
86 Hong Kong
87 Trinidad and Tobago
88 Venezuela
89 Greece
90 Singapore
91 Spain
92 Israel

Industrialized Countries

93 South Africa
94 Ireland
95 Italy
96 United Kingdom
97 New Zealand
98 Japan
99 Austria
100 Finland
101 Australia
102 Netherlands
103 France
104 Belgium
105 Germany, Fed. Rep.
106 Norway
107 Denmark
108 Canada
109 United States
110 Sweden
111 Switzerland

Capital Surplus Oil Exporters

112 Saudi Arabia
113 Libya
114 Kuwait

Centrally Planned Economies

115 China, People's Rep.
116 Korea, Dem. Rep.
117 Albania
118 Cuba
119 Mongolia
120 Hungary
121 Bulgaria
122 USSR
123 Poland
124 Czechoslovakia
125 German Dem. Rep.

* Data reported for a number.

used to calculate the ratios within the World Bank scheme came from the UNESCO statistical yearbooks. The list offers a cross-section of nations divided among levels or stages which approximate the economic development set, a set of factors descriptive of the major force in convergence theory. Appendix I contains the breakdown of the primary student/teacher ratios by country and year, while Table A below summarizes the information.

All but one time period within the four categories of nations show a decrease in the primary student/teacher ratio. When examining the mean ratios across the four categories at any time period, the order of the ratios supports the proposition that the greater the values of the economic development set, the lower the primary ratio. Even more crucial to the convergence hypothesis is that within the three major categories (low income, middle income, and industrialized) there is substantial evidence, as shown by the indexes of dispersion ($s.s./X$), that convergence is indeed occurring. This is especially apparent when comparing the 1950 indexes to the 1974/75 indexes. The practical problem of the lack of information for long periods of the past and future for all of these countries, as well as the unrefined character of the categories do not permit any evaluations to be made on the convergence of the primary ratios across categories. Evident in the table is the apparent unimportance of one specific type of national context, centrally planned economy versus capitalist economy. The mean for the industrialized category and the centrally planned category, or which data was found for only the more industrialized members, preempts this category of being substantively important here. This is a finding highly consistent with convergence theory.

TABLE A
PRIMARY STUDENT/TEACHER RATIO

World Bank Scheme	1950		1965		1974/75	
	X	s.d./X	X	s.d./X	X	s.d./X
Low Income	51.27	.48	45.25	.34	45.98	.307
Middle Income	39.2	.47	36.47	.28	34.99	.288
Industrialized	30.24	.22	24.87	.164	21.63	.18
Centrally Planned Economies	31.4	.16	26.43	.14	22.2	.199

Some of the problems based on the lack of a longer time frame and inadequacy of cross-sectional data may be solved by the following table of primary student/teacher ratios. Primary level ratios were calculated for a group of 24 European countries at regular time intervals for the period 1860-1960 from the book, European Historical Statistics. The individual ratios for the nations can be found in Appendix II while the summary information is in Table B below.²

This table does show a continuous decline in the primary student/teacher ratio since 1860 which approximates the period of modernization in terms of the economic development set and changes in the cultural systems of the nations. There appears to be consistency between the longitudinal stages of the path these European nations have evolved through and the cross-sectional categories of the World Bank scheme. It would be very interesting to examine the correspondence between the levels of the economic development set factors of the low and middle income nations and the same factors for the European countries at their time periods when the primary student/teacher ratios were similar. The longitudinal table also shows two distinct periods of the disruption of convergent trends. These periods of disruption parallel periods of serious strife in Europe. Convergence still appears to be a strong force especially if the data for the European countries from the World Bank scheme is added for the periods 1965 and 1974/75. The longitudinal data would support that the convergence evident in the cross-sectional table indicates continued convergence rather than renewed divergence, though periodic disruptions may occur.

² As is the problem with all of the figures calculated from this source, tremendous amounts of organizational and curricular changes in education have taken place over this time span which reduces the comparability of the figures.

TABLE B
LONGITUDINAL: EUROPEAN PRIMARY
STUDENT/TEACHER RATIOS
HISTORICALLY

YEAR	X	s.d./ $\bar{X}$
1860	60.4	.414
1870	60.2	.284
1880	57.0	.14
1890	46.2	.263
1900	47.1	.263
1910	46.7	.292
1920	39.7	.182
1930	39.1	.238
1940	34.9	.243
1950	33.3	.303
1960	27.7	.222

A truly remarkable facet of the findings is that both low and middle income nations decreased their student/teacher ratios at the primary level and converged within their respective groups while simultaneously experiencing the greatest enrollment shock at this level relative to the industrialized countries. The experience of enrollment shock would account for the greater persistence of diversity in the ratios for these groups and their slower rate of decline relative to the industrialized nations where primary enrollments had "settled down" greatly. But just the fact that the ratios declined despite the demographic counterforce which required the mobilization of large amounts of resources just to maintain already existing ratios, adds independent explanatory power to the other two forces of convergence: the economic development set and changes in the cultural system.

The position of the U.S.A. relative to its "peer" nations is of special interest. America's average student/teacher ratios for the primary level for 1950, 1965, 1974/75 were 31, 28, and 20 respectively. Has the U.S.A. been deviant in terms of over-spending to produce low primary ratios or over-conscious of qualitative concerns in the institutional setting? From the data here, it would seem the answer is no for the mean ratios for the same time periods for its peer nations (i.e., other industrialized category countries from the World Bank scheme) are 30.24, 24.87, 21.63. The U.S.A. has consistently been in line with the changes in other industrialized countries.

Do the propositions hold across nations for the secondary and tertiary levels of the educational system? A consistent pattern found across all nations and all levels of the economic development set has been a decreasing student/teacher ratio being associated with higher

levels of the educational system. The reasons for this pattern and for the basic differences between secondary/tertiary schooling and primary schooling are relevant to the tests of the propositions at these levels. Secondary and, to a greater extent, tertiary schooling differs from primary schooling in the unit costs of schooling, the complexity of the body of knowledge to be disseminated and the technology to be used in instruction, the organizational diversity of the kinds of schooling types and arrangements at the upper levels, and the degree of selectivity of admissions to the upper levels. Furthermore, each nation more culturally and historically conditions the institutional arrays and forms which comprise the secondary and tertiary levels of the educational system. Consequently, we would expect less convergent movement over time, slower rates of change, and possibly differences in the direction of change of secondary, but more likely tertiary, student/teacher ratios since these have historically been more like elite preserves and well-tended enclaves so that enrollment shock may produce increasing ratios. These modifications of the basic propositions should be more relevant for the tertiary level.

Appendix III presents the individual nation student/teacher ratios according to the World Bank scheme for the secondary level and Table C summarizes that data.³ Appendix IV presents the individual nation secondary student/teacher ratios for the European nations longitudinally, while Table D summarizes that data. Finally, Appendix V presents the individual nation tertiary student/teacher ratios according to the World

³The secondary student/teacher ratio was calculated by dividing the total number of students in general only.

TABLE C
SECONDARY STUDENT/TEACHER RATIO

World Bank Scheme	1950		1965		1974/75	
	$\bar{X}$	s.d./ $\bar{X}$	$\bar{X}$	s.d./ $\bar{X}$	$\bar{X}$	s.d./ $\bar{X}$
Low Income	27.49	.82	21.52	.33	25.43	.37
Middle Income	18.78	.58	21.33	.33	25.12	.36
Industrialized	20.19	.27	16.18	.24	15.4	.16
Centrally Planned Economies	17.94	.12	17.2	.17	14.55	.12

TABLE D
LONGITUDINAL: EUROPEAN SECONDARY
STUDENT/TEACHER RATIOS
HISTORICALLY

YEAR	$\bar{X}$	s.d./ $\bar{X}$
1860	13.0	.504
1870	14.4	.335
1880	12.2	.268
1890	12.8	.406
1900	15.4	.309
1910	16.5	.281
1920	17.8	.265
1930	16.6	.236
1940	21.0	.377
1950	20.3	.399
1960	20.7	.218

TABLE E
TERTIARY STUDENT/TEACHER RATIO

World Bank Scheme	1950		1965		1974/75	
	$\bar{Y}$	s.d./ $\bar{Y}$	$\bar{X}$	s.d./ $\bar{X}$	$\bar{X}$	s.d./ $\bar{X}$
Low Income	9.61	.36	8.1	.8	9.6	.5
Middle Income	13.3	.76	12.96	.53	15.6	.58
Industrialized	11.65	.3	12.7	.26	13.5	.34
Centrally Planned Economies	14.5	.57	14.2	.49	12.6	.44

Bank scheme and Table E displays the corresponding summary information.^{4,5,6,7}

The only two distinct cases of decreasing student/teacher ratios at the secondary level observed, are for the nations under the categories of industrialized and centrally planned. Comparison of the indexes of dispersion for two time periods, 1950 and 1974/75, show that all four categories of the nations in the World Bank scheme have converged within their respective category on the secondary ratios. Both of these observations are true in spite of the differing ways nations organize their secondary level (e.g., tracking, selectivity, curriculum, etc.). There exists substantially less differences between the means of all these groups at any time period than was the case concerning the same categories for primary level ratios. This may be attributable to some of the distinguishing characteristics of the two levels. Enrollment shock at the secondary level probably accounts for the opposite and ambiguous patterns for the middle and low income countries but cognizance of the complexity and cost of secondary schooling as well as the longer adjustment period for enrollment expansions (i.e., have time to prepare

⁴ The Tertiary student/teacher ratios were calculated by dividing the total number of students in all forms of higher education by the number of teachers in all forms at the higher education level.

⁵ The figures calculated for the low and middle income groups should be carefully interpreted for many of these nations have very few students in higher education which makes it easy to have a low student/teacher ratio and in some cases many of their students are abroad.

⁶ A special danger of the teacher figure in the calculations is that non-instructors may have been included in the UNESCO data which would cause the calculated ratio to be considerably less indicative of class size.

⁷ The "class" at this level of the system may actually lose a great deal of meaning in view of the combinations of instructional settings at this level (e.g., lecture, discussion, research, etc.).

more teachers), help to minimize the impact of demographic changes.

The longitudinal data when viewed at a distance, 1800 versus 1960, do not show an important movement toward convergence even though the mean shows a relatively steady increase. The trend in means of Table D parallels that of the medium income group, both of which show nations undergoing enrollment expansion greater than the low income group and before the "settling down" of the industrialized nations.

The table corresponding to the tertiary level student/teacher ratios, in contradistinction to the previous levels, indicates substantial stability in both mean ratios and the indexes of dispersion at the three time periods in all categories. Of course these results may reflect a real phenomenon, but they may also be due to the nature of the data which collapsed all types of tertiary education together, or they may be related to the greater diversity in forms and structures of higher education cross-nationally in terms of types of institutions, selectivity, research orientation, and the common experience in all nations of enrollment shock. These factors could resist the emergence of a common standard for the tertiary ratio.

The U.S.A.'s efforts with regard to secondary and tertiary level ratios relative to its peers is definitely comparable if not increasingly deviant on the higher end. The ratios for the periods 1950, 1965 and 1974/75 were 16.8, 20.6 and 18.4 respectively for secondary, and 9, 13.4, and 16.2 respectively for tertiary. The means for the industrialized nations as a whole can be found in Tables C and E. The probable explanation is the greater expansion of at least the tertiary level in the U.S.A. relative to the other industrialized category nations.

Convergence is a useful perspective through which to examine social

phenomena in educational systems cross-nationally. This paper has used student/teacher ratios as one example. There is a lawful progression of student/teacher ratios cross-nationally which is associated with increased economic accumulation, technological utilization, industrialization, and changes in the cultural system. This is certainly true for the primary level of the educational system and appears to be true for the secondary level. It does not appear to be the case for tertiary education as of yet, mainly because of its distinctive characteristics which act to limit enrollment and teacher increases, producing a slow moving stability.

It is remarkable that we find convergence in light of the forces of diversity listed earlier and the diversity of growth rates of students and teachers across and within nations, as well as within subject areas in schools. The student/teacher ratios are related to both the responsiveness of the educational system to demographic changes in the student population and the compensating responsiveness of the system to balance teacher and student numbers, i.e., construct class sizes, in some arrangement. When viewing the ratios across time, across categories of nations, and across levels of the educational system, we have looked at nations whose growth, stability, and even decline, yet the trend continues, at least at the primary and secondary level, for nations to increasingly construct their classrooms more and more alike with regard to student/teacher ratios. An arrangement construction which has been consistent with economic development and changes in the cultural system and may be viewed as the fulfillment of a global imperative of instructional technology or a developmental luxury.

The near future contains the production of an elaboration of the

ideas and propositions set forth in this report. Using regression and panel analysis, and incorporating the data in the appendices into a larger data set, further specifications of the behavior of student/teacher ratios will be made including the separation of the effects of time and the economic development set, as well as other significant factors.

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APPENDIX L

Primary S-T Ratios

Appendix I

<u>Low Income</u>	<u>1950</u>	<u>1965</u>	<u>1974-75</u>
Bhutan	-	-	23.8
Cambodia	4/.3	-	-
Lao PDR	-	37.3	37.3
Ethiopia	35.5 (1955)	41.5	-
Mali	43 (1955)	40.8	35.2
Bangladesh	-	43.6	-
Rwanda	35.5	67.1	50.1
Somalia	26	26	57
Upper Volta	73.8 (1955)	47.4	45.7
Burma	73.7	53.3	-
Burundi	-	40.4	31.3
Chad	68 (1955)	83	75
Nepal	22.9 (1954)	28.8	24.3
Benin	-	41.7	53.4
Malawi	81.4	39.6	58.1
Zaire	-	37.5	40.9
Guinea	79	65	57
India	27	38	40
Viet Nam	-	-	-
Afghanistan	32.8 (1955)	50.3	36.2
Niger	40.1 (1955)	41.7	40.7
Lesotho	-	57.1	52.5
Mozambique	117	77.5	69.3 (1972)
Pakistan	33.2	42.2	41.9
Tanzania	-	52.3	53.4
Haiti	48.2 (1955)	45.7	45.1 (1971)
Madagascar	-	71.2	63.5 (1973)
Sierra Leone	37.4	31.9	31.6
Sri Lanka	-	-	-
Central African Empire	93 (1955)	53.6	68.8
Indonesia	59.2	41.4	29.9 (1973)
Kenya	47.5	34.1	33.5
Uganda	29.1	34.9	-
Yemen	34.5	55.8	-
$\bar{X}$	51.27	45.25	45.98
s.d.	24.84	15.22	14.09
s.d./ $\bar{X}$	.48	.34	.307

Primary S-T

<u>Middle Income</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Togo	109.0 (1955)	50.3	59.7
Egypt	-	39.2	40
Yemen PDR	-	31.1	30.4
Cameroon	-	47	51
Sudan	49.9 (1955)	47.6	39.4
Angola	34.8	45.4	40.9 (1972)
Mauritania	25.8 (1955)	19.9	22.1 (1971)
Nigeria	25	33	34
Thailand	36.3	34.7	-
Bolivia	42.3 (1956)	27.9	-
Honduras	23	29	35
Senegal	50.1 (1955)	42.6	-
Philippines	51	39	29
Zambia	42.1 (1955)	51	48
Liberia	27.6 (1951)	31.8	41.2
El Salvador	30	34	43
Popua, New Guinea	41	31	30.5
Congo, Peoples Republic	116.8 (1955)	59.9	60.8
Morocco	26.1	38.6	41.6
Phodesia	-	-	-
Ghana	30.2	32.1	29.7
Ivory Coast	66 (1955)	47	45
Jordan	42.5	38.4	35.7
Colombia	41	36	33
Guatemala	21.8	32.5	35.3 (1973)
Ecuador	41.6	37.4	39.2
Paraguay	31.6	30.3	27.7
Korea, Rep. of	56.5	62.4	51.8
Nicaragua	28.1	34	-
Dominican Republic	-	-	54.8
Syrian Arab Rep.	-	36.1	34.6
Peru	42.2	33.9	39.1
Tunisia	34.2	55.6	40
Malaysia (West)	-	28.4	31.6
Algeria	34.8	43.5	40.9
Turkey	45	46	34

Primary S-T (cont'd)

<u>Middle Income</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Costa Rica	28	27	29
Chile	41.3 (1956)	52.3	34.9
China, Rep. of	-	-	-
Jamaica	49.6	57.4	39.4
Lebanon	17.3 (1954)	24	-
Mexico	40.2	45.6	45.6
Brazil	32.3	28.2	21.7
Panama	32	30	26
Iraq	28.5	22.5	25.6
Uruguay	28.1 (1951)	31	22.4
Romania	26.6	22.9	20.8
Argentina	24	20	18
Yugoslavia	45	29	22
Portugal	42.7	31.9	27
Iran	29.3 (1951)	30.1	30.5
Hong Kong	28.4	31.3	32.1
Trinidad and Tobago	48.1	33.6	33.2 (1972)
Venezuela	36	34	31
Greece	48 (1955)	36	32
Singapore	28.2	29.3	30.8
Spain Israel	35	34	29
Israel	23	20	14
$\bar{X}$ -	39.2	36.47	34.99
s.d. -	18.25	10.15	10.07
s.d./ $\bar{X}$ -	.47	.28	.288

Primary or First Level

<u>Industrialized</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Ireland	37	33	30
Italy	27	22	19
U.K. (England & Wales)	30	25	22
New Zealand	31	25	23
Japan	37	28	25
Austria	32	20	23
Finland	24	23	19
Australia	29.4	28.2	24.1
Netherlands	35	31	28
France	28 (1955)	25	23
Belgium	20 (1960)	21	20
W. Germany	48	27	23
Norway	26	21	17
Denmark	34	19	16
Canada	29.6	26.6	-
U.S.A.	31	28	20
Sweden	19	20	16
Switzerland	26.3	-	-
X -	30.24	24.87	21.63
s.d. -	6.72	4.07	3.99
s.d./X -	.22	.164	.18

Primary S-T Ratio

Centrally Planned Economies

	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Hungary	33	23	16
Bulgaria	25.5	22.6	20.5
USSR	31	-	-
Korea, Dem. Rep.	-	-	-
Poland	39	28	21
Czechoslovakia	28	23	20
Cuba	28.1	29.4	22.9
East Germany	36	-	-
Mongolia	26 (1956)	32	30 (1970)
Albania	36	27	25
China, Peoples Rep.	-	-	-
$\bar{X}$ -	31.4	26.43	22.2
s.d. -	4.86	3.67	4.41
Index of Dispersion -	.16	.14	.199

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APPENDIX II

Teacher-Pupil Ratios for Primary

Appendix II

YEAR	Austria	Belgium	France	Hungary	Italy	Netherlands	Norway	Portugal	Spain	Sweden	England & Wales	Scotland	Bulgaria	Denmark	Finland
1860	60	56			36	48					102				
1865	49	54		55	37	42					79	81			
1870	52	63		62	39	42	65			71	85	84			
1875		62		75	41	43	63			66	74	77			
1880	50	41	41	75	41	38	57				64	67			37
1885	51		41	78	41	34	52	63			53	60			34
1890	50		38		41	36	52			51	49	56	46		37
1895	48		36	83	42	32	49				47	52	41		38
1900	46		35	80	42	30	46			45	40	46	41		36
1905	44		37	77	45	32	46			41	36	41	46		33
1910	41		36	75	45	30	44			37	33	37	44		32
1915				69	42	29	40		48	29		33	51		32
1920	28		31	49	40		35			26	31	35	41		33
1925	33		31	39	37	32	34	37		23	30	32	31		31
1930	36		35	50	44	33	36	45		22	29	31	38		29
1935	41		37	49	43	37	35	43	52	20	28	30	39		38
1940			32		41	38	29	45	47	19			37		28
1945	26		31		33	35	27	40	49	18	30				26
1950	24		30	35	27	35	27	43	35	19	30	30			23
1955	21		32	24	27	36	29	40	40	18	31	31			24
1960	22		25	24	22	34	26	34		15	29	30	25		23
1965	21		30	23	22	31	23	32			30	29	23		21

Teacher-Pupil Ratios for Primary Level (Cont'd)

YEAR	Germany	E. Germany	W. Germany	Greece	Romania	Yugoslavia	Switzerland	Czechoslovakia	Poland
1860									
1865									
1870						39			
1875						40			
1880					36	45			
1885					37	53			
1890					44	51	50		
1895					50	50	49		
1900	61				59	54	45		
1905	59				79	56	45		
1910	55			56	75	58	44		
1915							43		
1920	45				61	61	40		
1925	36				46	42	36	41	46
1930	40			53	56	52	35	39	
1935	43			59	53	43	35	39	
1940							33		
1945						59	32	29	51
1950			48		27	60	33		40
1955			36	46	21	33	34	28	33
1960			36	39	25	33	31	21	33
1965			35	35	23	29		23	30

Appendix II - Range of Pupil-Teacher Ratios at Primary Level

<u>YEAR</u>	<u>RANGE</u>
1860	36-102
1865	37-81
1870	39-85
1875	41-77
1880	37-75
1885	34-78
1890	36-56
1895	32-83
1900	30-80
1905	32-77
1910	30-75
1915	29-69
1920	26-49
1925	23-39
1930	22-50
1935	20-52
1940	19-47
1945	18-49
1950	19-43
1955	18-40
1960	15-34
1965	21-32

APPENDIX III

Appendix III

Secondary S-T Ratios

General only (differs by National import of it)

<u>Low Income</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Bhutan	-	28.1	-
Cambodia	46.9 (1955)	24.7	-
Lao PDR	-	-	-
Ethiopia	50 (1955)	31.5	29.5
Mali	31.4	8.9	13.3
Bangladesh	-	-	-
Rwanda	24.7	11.2	-
Somalia	10.2	16.2	22.9
Upper Volta	19.6 (1955)	24.2	22.9
Burma	33.1	39.6	34.7
Burundi	-	11.4	-
Chad	23.6 (1955)	20.9	32.3
Nepal	20.5 (1954)	17.5	24.3
Benin	-	30.6	38.3
Malawi	47.3	20.2	20.7
Zaire	-	-	-
Guinea	27.5 (1955)	29.4	-
India	7.5	20.5	17.2
Viet Nam	-	-	-
Afghanistan	16.2	28.4	22
Niger	26.6 (1955)	15.9	22.8
Lesotho	12.96	23.5 (1966)	25.8
Mozambique	10.8	13.6	21.5 (1972)
Pakistan	26.6	26.9	18.6
Tanzania	-	-	-
Haiti	14.3	15.98	-
Madagascar	118.1	23.9	27.1 (1973)
Sierra Leone	17.1	19.5	32.3
Sri Lanka	-	-	-
Central African Empire	26.7 (1955)	20.9	54.4
Indonesia	21.5	25.3	17.3
Kenya	16	18.7	-
Uganda	10.5	19.6	16.3
Yemen	-	15.5	19.8
$\bar{X}$ -	27.49	21.52	25.43
s.d. -	22.57	7.01	9.37
s.d./ $\bar{X}$ -	.82	.33	.37

Secondary S-T Ratios

Middle Income

	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Togo	26 (1955)	23	43.6
Egypt	-	-	34.7
Yemen PDR	-	-	23.2
Cameroon	26.1 (1955)	26.4	-
Sudan	13.7 (1955)	18.2	22.3
Angola	13.3	21.5	18.9 (1972)
Mauritania	64 (1955)	-	24 (1971)
Nigeria	11.5	18.3	26.3 (1973)
Thailand	20.2	18.1	-
Bolivia	8.8	21.1	16.2 (1972)
Honduras	-	9.8	-
Senegal	22.7 (1955)	28.9	-
Philippines	25.8 (1955)	32.7	-
Zambia	17 (1955)	18.7	21.6
Liberia	15.7 (1956)	22.2	20.1
El Salvador	-	20.9	-
Popua, New Guinea	18.7 (1955)	19.1	23.2
Congo, Dem. Rep.	9.8	11.9 (1966)	47.9
Morocco	24	27.1	24
Rhodesia	-	-	-
Ghana	9.3	-	24.2
Ivory Coast	36.3 (1955)	25.9	24.1
Jordan	15.6	23.5	21.8
Colombia	11.2	13.6	20.1
Guatemala	7.2	8.4	-
Ecuador	9.8	10.5	15.7
Paraguay	5.4	10	11.3 (1973)
Korea	29.8	37.3	39.7
Nicaragua	9.5	16.8	36.5 (1972)
Dominican Rep.	-	23.1	-
Syrian Arab Rep.	-	-	21.2
Peru	14.2 (1951)	16.4	24.1
Tunisia	16.7	18.5	-
Malaysia (West)	15.4	24	27.7
Algeria	27.4 (1955)	24.5 (1967)	26.9
Turkey	13.8	27.7 (1967)	30.5
Costa Rica	-	21.3	23.6
Chile	-	33.1	16.1
China, Rep. of	21.2	27.2	-

APPENDIX IV

Secondary S-T Ratio

Centrally Planned Economies

	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Hungary	17.5 (1955)	18	15.2
Bulgaria	21	15.2	13.1
USSR	18.6	19.1	-
Korea, Dem. Rep.	-	-	-
Poland	19.3	22.2	13.8
Czechoslovakia	17.8 (1955)	13.6	14.9
Cuba	13.5 (1952)	15.6	12.7
E. Germany	18.8	14.7 (1966)	-
Mongolia	-	-	-
Albania	17	18.2	17.6 (1971)
China, People's Rep.	-	-	-
X	17.94	17.2	14.55
s.d.	2.18	2.89	1.79
s.d./X	.12	.17	.12

Secondary S-T Ratio

<u>Industrialized</u>	<u>1950</u>	<u>1965</u>	<u>1964/75</u>
Ireland	19.7	14.9	14 (1973)
Italy	10.6	12.2	-
England & Wales	20.2	17.4	15.9
New Zealand	20.2	19.7	-
Japan	22.4	18.9	-
Austria	17 (1955)	15.1	17.6 (1973)
Finland	33.5	19.5	16.7 (1973)
Australia	22.2	19.6	15.4
Netherlands	18.2	19	16.2
France	26 (1955)	13	-
Belgium	25.3	7.9 (1966)	-
W. Germany	24.4	19.4	14.9
Norway	14.1	13	-
Denmark	13.9	-	-
Canada	24.5	17.5	-
U.S.A.	16.8	20.6	18.4 (total second)
Sweden	15.2	11.1	9.7
Switzerland	19.3	-	-
$\bar{X}$ -	20.19	16.18	15.4
s.d. -	5.44	3.8	2.53
s.d./ $\bar{X}$ -	.27	.24	.16

Secondary S-T (cont'd)

<u>Middle</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Jamaica	16.9	24.2	23.3
Lebanon	-	16.8	-
Mexico	7.2	13.5 (1968)	-
Brazil	13.1	17.2	-
Panama	21.1	19.2	22.3
Iraq	18.1	34.8	27
Uruguay	-	16.6	-
Romania	16.6	18.9	16.8
Argentina	5.9	6.3	7.3
Yugoslavia	11.8	20.5	22
Portugal	44.3	19.8	14.4
Iran	18.4 (1951)	29.9	28.9
Hong Kong	13.8 (1951)	24.4	-
Trinidad & Tobago	38.9	26.2	24.4 (1971)
Venezuela	12.4	22.7	-
Greece	29.6 (1955)	33.3	32.9 (1972)
Singapore	26.3 (1955)	25.4	26
Spain	13.5	29.2	50.1
Israel	14.5	10.7	-
$\bar{X}$ -	18.78	21.33	25.12
s.d. -	10.96	7.07	8.99
s.d./ $\bar{X}$ -	.58	.33	.36

Teacher-Pupil Ratios for Secondary Schools

Appendix IV

YEAR	Austria	Belgium	Hungary	Italy	Netherlands	Norway	Portugal	Spain	Sweden	England & Wales	Scotland	Bulgaria	Finland	Germany	E. Germany
1860	20	12			7										
1865	19	14	19		5										
1870	16	15	17		6										
1875	14	16	14		6	10									
1880	14		15		7	11									
1885	15		14		7	11								8	
1890	15				7	10								8	
1895	15		15		8	11	18					31	9		
1900	16		15		9	10	17				20	23	10		
1905	15		15		10	8	15				18	22	10		
1910	13		15	14	10	11	21	14		16	19	24	13	21	
1915			26	14	11	12	21	15			16	33	12		
1920	13		19	15	9	15	17	16		19	27	24	14	22	
1925	12		21	15	10	13	17	16		18	24	22	15	19	
1930	12		21	11		14	21	14		19	23	22	15	18	
1935	13		21	13		16	23	16		19	23	33	15	17	
1940				12		16	33	15				28	17		
1945	15			11		16	39	15		21			18		
1950	16		17	10	18	15	42	17		21	17	29	17		
1955	17		20	12	18	17	49	17	21		21	15	22	20	
1960	15		27	12		21	20	22	18		21	16	20	21	
1965	14		34	12	19	20	21	29	22		20	14	18	19	

Teacher-Pupil Ratios for Secondary Schools (cont'd)

<u>YEAR</u>	W. Germany	Greece	Romania	Yugoslavia	Switzerland	Czechoslovakia	Poland
1860							
1865							
1870				18			
1875				15			
1880				14			
1885				19			
1890				19	18		
1895				16	21		
1900				14	20		
1905				17	22		
1910					23		
1915					17		
1920				21	18		
1925	21	19	21	17		15	
1930	20	12	19	15	13	14	
1935	18	11	20	27	18		
1940					26		
1945				6	25		21
1950	24	32	18	9	24		19
1955	20	30	17	12	26	19	19
1960	21	30	23	16	28	21	21
1965	21	31	27	20		20	27

Appendix IV - Ranges of Pupil-Teacher Ratios Per Secondary Schools

<u>YEAR</u>	<u>RANGE</u>
1860	7-20
1865	5-19
1870	6-17
1875	6-16
1880	7-15
1885	7-15
1890	7-15
1895	8-31
1900	9-23
1905	8-22
1910	10-24
1915	11-33
1920	9-27
1925	10-24
1930	11-23
1935	13-33
1940	12-33
1945	11-39
1950	10-42
1955	12-49
1960	12-27
1965	12-34

APPENDIX V

Appendix V
Tertiary S-T Ratios

<u>Low</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Bhutan	-	-	-
Cambodia	7.4	-	-
Lao PDR	-	-	5.4
Ethiopia	-	5.6	14.9 (1973)
Mali	-	3.48	7.48
Bangladesh	-	-	-
Rwanda	-	2.9	6.9
Somalia	8.4	4.6	6.5
Upper Volta	-	-	7.4
Burma	13.7	14.2	14.1
Burundi	-	2.8	3.9
Chad	-	-	4.5
Nepal	10.6	13.5	15.4
Benin	-	7.8	13.3
Malawi	-	3.7	6.4
Zaire	-	6.7	8.8
Guinea	-	4	-
India	16.5	-	-
Viet Nam	-	-	-
Afghanistan	6.2	6.7	11.2
Niger	-	-	7.6
Lesotho	-	-	7.8
Mozambique	-	4.4	8.04 (1972)
Pakistan	-	26.6	22.1
Tanzania	-	-	-
Haiti	4.9	-	-
Madagascar	10.4	17.9	19.7 (1972)
Sierra Leone	11.3	3.6	5.1
Sri Lanka	-	-	7.9 (1973)
Central African Empire	-	-	-
Indonesia	9.7 (1955)	-	6
Kenya	-	-	-
Uganda	6.6	8.9	9.3
Yemen	-	-	-
<u>X</u>	9.61	8.1	9.6
<u>s.d</u>	3.43	6.5	4.8
<u>s.d</u>	.36	.8	.5
<u>X</u>			

Tertiary S-T Ratio

<u>Middle</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Togo	-	10.4	-
Egypt	-	23.3	21.4
Yemen PDR	-	-	-
Cameroon	-	-	-
Sudan	-	9	16.8
Angola	-	8.3	8.2 (1971)
Mauritania	-	-	-
Nigeria	-	6.9	6.7 (1973)
Thailand	33.2	10.5	7.8
Bolivia	-	7.3	-
Honduras	-	-	16.1
Senegal	12.1 (1955)	-	20.1
Philippines	22.2 (1955)	23.1	24.1
Zambia	-	-	-
Liberia	6.9 (1955)	5.3	-
El Salvador	4.7 (1955)	6.7	13.4
Popua, New Guinea	-	-	-
Congo	-	10.5	13.4
Morocco	-	20.6	17.7
Rhodesia	-	-	-
Ghana	3.6	7.4	7.8 (1973)
Ivory Coast	-	-	16.7 (1973)
Jordan	6.2 (1955)	16	14.6
Colombia	6.1	6.8	8.4
Guatemala	5.9	14.7	16.2
Ecuador	8.1	8	-
Paraguay	9.5 (1955)	7.4	8
Korea	30.7 (1955)	20.3	19.4
Nicaragua	10.2 (1951)	7.7	-
Dominican Rep.	-	15.9	-
Syrian Arab Rep.	-	38.9	64.8
Peru	7.5	9.2	16.9
Turisia	-	17.3	12.3
Malaysia (West)	-	9.1	13.2
Algeria	-	-	-
Turkey	19.7	16.8	15.9
Costa Rica	47.9 (1955)	11.7	-
Chile	4.5 (1949)	4.9	13.1
China, Rep. of	9.9	-	-
Jamaica	-	-	13.2

Tertiary S-T Ratios (Cont'd)

<u>Middle</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Lebanon	-	14.2	16.1
Mexico	-	7.8	13
Brazil	5.6	4.7	14.8
Panama	17.3	20.1	24.3
Iraq	-	19.5	24.1
Uruguay	7.2 (1955)	-	14
Romania	9.3 (1955)	10	11
Argentina	18.3	16	13.2
Yugoslavia	11.2	11.7	17.1 (1973)
Portugal	-	16.4	14.2
Iran	11.2	11.9	11
Hong Kong	-	9.5	13.6
Trinidad & Tobago	11.5	7.1	-
Venezuela	7	9.7	13.5
Greece	24.3	25.2	17
Singapore	-	15.8	10.4
Spain	14.1	16.8	15.9
Israel	-	-	5.4
X	-	13.3	12.96
s.d.	-	10.15	6.82
s.d.	-	.76	.53
X	-		.58

Tertiary S-T Ratios

<u>Industrialized</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Ireland	12.8	-	9.1
Italy	15	15.7	21.8
England & Wales	11.6	-	-
New Zealand	-	-	-
Japan	7.5	11.3	12.5
Austria	18.5	10.7	8
Finland	14	9.9	16.2
Australia	13.3	-	13.7
Netherlands	-	-	-
France	-	-	-
Belgium	-	-	-
W. Germany	-	-	8.5
Norway	10.7	9.6	-
Denmark	-	-	-
Canada	6.7 (1955)	18.6	15.9
U.S.A.	9 (1955)	13.4	16.2
Sweden	-	-	-
Switzerland	9	-	-
<u>X</u>	11.65	12.7	13.5
<u>s.d.</u>	3.53	3.4	4.54
<u>s.d.</u>	.2	.26	.34
<u>X</u>			

Tertiary S-T Ratio

<u>Centrally</u>	<u>1950</u>	<u>1965</u>	<u>1974/75</u>
Hungary	5.7 (1955)	11.1	8.9
Bulgaria	12.3	15.3	11.8
USSR	15.4	19.2	15.3
Korea, Dem. Rep.	-	-	-
Poland	6.6 (1955)	-	-
Czechoslovakia	-	7.8	6.8
Cuba	29.5 (1952)	6.8	11.9
E. Germany	20 (1951)	-	9.1
Mongolia	-	-	12 (1971)
Albania	11.7	24.7	24.9 (1971)
China, People's Rep.	-	-	-
$\bar{X}$ -	14.5	14.2	12.6
s.d. -	8.25	6.95	5.6
$\frac{s.d.}{\bar{X}}$ -	.57	.49	.44